

# THE CRUSHED STONE JOURNAL

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# The CRUSHED STONE JOURNAL

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## Values of Accident Prevention<sup>1</sup>

**A Consideration of the Economic and Psychologic Values of Reducing Industrial Accidents and an Analysis of Conditions in the Crushed Stone Industry**

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SINCE the time when our sturdy Puritan forefathers landed on Plymouth Rock and fought valiantly and successfully the elements and hostile Indians to establish a foothold and a living place in the land they named New England, and when under fairer skies and on more fertile soil the cavaliers of Old England established their colonies in what is now Virginia, this nation has flourished and prospered. With natural resources of almost unbelievable richness and seemingly unlimited in quantity, with a population growing by leaps and bounds, not only through a prolific birth rate, but enlarged steadily and constantly by immigration from the countries of the Old World, the tide of progress has continued to sweep westward. Blessed with material prosperity and success, it has seemed as though the thread of our destiny has been woven into the fabric of world affairs by the hand of a fate graciously inclined to our needs and welfare, forming a part of that design known only to the Master Weaver. Nor is this prosperity confined to any small and fortunate class of our population; it is shared and enjoyed by the mass of our citizenry. True it be that some fortunes have been amassed which would awaken the envy of a Croesus or Nero, thrown into strong relief by the dark shadows of poverty among a few as abject and misery-stricken as were the lower classes of France immediately preceding the French Revolution. But these extremes present with us are limited in number and are the result of circumstance and opportunity seized by some and ignored by others, whether their failure be due to ignorance, laziness, drunkenness, inability or any of the other causes operating to

prevent a successful grasping of the potential opportunities that confront us all in this nation, differing thereby fundamentally from the poverty of the serfs held in political and economic subjugation by a ruling class fattening in idleness on their labor. We have, as Gladstone pertinently pointed out, the froth and the dregs, but thank God for the good beer in between. In view of our living in these days when prohibition has come and largely gone, the thought of the glass of beer must be abandoned, though with reluctance.

With a continent stretching to the westward of the early settlers on the eastern shores, the western limit of which was not even conceived by them, it is not strange that the generations following came to believe that our natural resources were unlimited in extent. It is only in recent years when we have spanned this three thousand miles of territory and planted cities on the Pacific Coast rivaling in magnificence and in population those of the East that we have come to realize that these natural resources must be conserved and guarded with jealous care if we are to continue to thrive and prosper. It is not so long ago when the phrases "conservation of forests," "of water power," "of coal," "ore," and the other gifts of a beneficent deity sounded strangely in our ears. We have come now to accept such economy as a matter of course; and yet we have largely continued to overlook the conservation of the greatest of all material, mankind itself. Of all the material with which we have to work, there is none so vitally important nor so fascinating as the human.

Over its coffee cups the world reads the morning newspapers with horrified amazement as fatality after fatality is reported among the aviators daring the trans-oceanic flights and asks that laws be passed pro-

<sup>1</sup>Paper presented before the Quarry Section of the National Safety Council at the Sixteenth Annual Safety Congress, Chicago, September 28, 1927.



hibiting such a useless sacrifice of life, and yet complacently we go our way without giving thought that last year in the United States alone approximately 180,000 persons suffered accidental death and 7,500,000 endured casualties that did not result fatally. These daring aviators risking their lives in the cause of science and human progress bear that relation to this age as did Columbus, Magellan, De Soto and others of their courageous faith to an era past and gone. Our pride in achievement responds with a thrill to the accomplishment of such men, but we can see nothing more in industrial accidents than sordid carelessness on the part of the employee or almost criminal lack of interest on the part of the employer, with possible resultant poverty, misery and mental anguish to the family of the injured one.

A relatively new thought is manifestly permeating industrial activity—the recognition of the interdependence of employer and employee, a relationship which now approaches economic equality. We are beginning to recognize beyond a mere lip statement to that effect that the employer prospers in direct ratio to the prosperity of his employees. Industry is demanding a new type of executive, one who not only intimately knows the processes of manufacture, but who also sympathetically visions and understands the problems which confront his men, one who while directing and governing creates in those associated with him enthusiastic cooperation; in other words, a leader, not a boss, one whose integrity and qualities of judicial fairness and human sympathy awaken and hold the confidence of his men. To such an executive the physical safety of his men is of paramount importance. He is motivated in safeguarding them in their employment no less by reason of their economic value, impaired as it is by lost time from any cause, than by his humanitarian interest in their welfare and contentment of mind. A contented worker is obviously of more value than one discontented and disgruntled, whether his disturbed state of mind comes from a belief that he is underpaid, unappreciated or unduly exposed to unnecessary hazards. We have outgrown the moral crutches evidenced by such phrases as "Business is business," "Honesty is the best policy," and "Caveat emptor." We now clearly perceive that business is good business only when it is conducted along sound, ethical lines. We are honest because we know that we should be, and the values of honesty come as by-products. The buyer is not expected to beware, but is protected, and so should be the worker.

Is the time and money required to promote accident prevention in any particular plant economically justifi-

able? The answer to this question is in the handwriting on the wall, with abundant proof of an affirmative answer to the query in the experience of our largest industries. The evidence is overwhelming that a safe plant is an efficient one, and conversely, an efficient plant is a safe one. It is being constantly demonstrated that by giving due attention to accident prevention, insurance costs, however carried, are lowered; and, moreover, production is correspondingly increased.

The Committee on Safety and Production of the American Engineering Council has just completed its study of the relationship between industrial safety and production. Some of its conclusions, after the most exhaustive and thorough study ever given to this subject, confirm the beliefs held by some of us and are startling to those who do not yet share them. There is detailed material in the report of the committee to support the statement that maximum productivity is dependent upon the reduction of accidents to an irreducible minimum, and that there is such an intimate relationship between safety and production that it is impossible for a plant to continue to increase in productivity unless it reduces at the same time its accident rates.

Not so long ago a well known producer of a mined material was quoted as saying that he would not sacrifice production for the sake of reducing accidents in his mines. Such an attitude would be humorously paradoxical were it not tragic. In discussing the incident the memory whimsically came to mind of an old negro who said that on his farm in Southern Georgia he used to raise horses, black horses and white horses, but that he had to give up raising black horses because they ate more than did the white horses. When asked why this was so, he said, "Ah can't exactly account fo it lessin it is that ah had mo' black hosses than ah had white hosses." The logic of the manufacturer and of the old negro is equally unconvincing to the enlightened executive. It seems almost self-obvious that a clean, neat, and safe plant, factory or mine in which the employees contentedly work under conditions as pleasant as the circumstances of the work may permit is necessarily more efficient and richer in productivity than one of which the opposite is true.

Though it is generally recognized that a reduction in the number and severity of accidents is reflected in lower insurance costs, however the insurance be carried, this is not the only nor even the largest financial saving. The Travelers Insurance Company of Hartford analyzed five thousand specific accident reports drawn at random from the claim files of that company, disclosing the almost amazing fact that the "hidden"

cost of accidents is four times the direct or insurable cost. In this item of "hidden" costs such factors were considered, weighed and estimated as lost time of injured employee, time lost by other employees who stop work out of curiosity or sympathy to render assistance, time lost by foremen and superintendents in assisting the injured one, preparing accident report, attending hearings before industrial commissions, injury to machinery or property as the result of the accident, interference with production, the less effective work of the man replacing the one injured and other factors which suggest themselves but are too numerous to mention. While this ratio of the hidden cost to the insurance cost may not be four to one, as analysis of these five thousand cases would indicate, it is at least something to one, and that something is too much. It is reasonable to believe that intelligent and organized effort to prevent accidents, both as to number and severity, results in lower insurance costs, even greater reduction in the hidden cost, difficult to estimate, and increased plant efficiency due in part to the improved morale of the worker. But for such endeavor there is yet another reason, either stronger or weaker, dependent upon one's ethical conceptions, and that is the obligation resting upon each of us to do his part to prevent needless suffering and privation.

It is not the intent of this discussion to enter into the various phases of the relation of employer to employee, nor to consider the several factors tending to produce that harmonious and sympathetic accord which alone can develop the fullest potentialities of any industry. That a human, intelligent and sympathetic interest on the part of the executive of any business is a factor in creating a responsive spirit on the part of the other workers must be admitted. While the paternalistic attitude may be resented, the kindly personal interest of the executive makes a direct appeal to the heart and head of the rank and file of labor. Assuming then that accident prevention is worth while from the several points of view upon which we have but lightly touched, there remains only to consider briefly ways and means for accomplishing the desired purpose.

With the thought that it would be both interesting and illuminating to ascertain the attitude of mind of quarry producers throughout the country as to accident prevention, a questionnaire was submitted recently to the members of the National Crushed Stone Association inquiring as to certain phases of this work as conducted by them. The response was generous and prompt. Certain of the information received in that

manner seems sufficiently interesting as to be worthy of comment.

Sixty per cent stated they were not members of the National Safety Council, and of the remaining 40 per cent holding membership, the average life of the membership is three years. The non-members were asked to state their reasons for not joining. Sixteen per cent replied that they did not believe membership in the Council would sufficiently assist in plant safety work to warrant their joining. The membership of 35 per cent has not been solicited in any manner. The literature concerning the value of membership and the work of the Council has not been sufficiently interesting or appealing to obtain the membership of 7 per cent. The other reasons were scattered, although tending toward an indication of unfamiliarity with the aims and purposes of the Council.

In reply to the question if membership in the National Safety Council was of value and if so, in what ways, such statements were received as—"It is worth while being associated with others in the safety movement," "Stimulates interest in safety and keeps one informed as to accident prevention," "In securing reliable data and information as to safe practices, as well as assistance personally rendered by safety officials," "Through safety posters and magazines."

It may be concluded from these replies that crushed stone producers to a much greater extent should hold membership in the National Safety Council, and a fair inference is set up that the responsibility for the present low percentage of membership must be shared in part, at least, by the Council itself, due to the fact that the membership of so large a percentage has not been solicited in any manner. While it is not our intention to presume to suggest methods to the Council, it is commonly recognized that personal solicitation is far more effective than correspondence; but every member of this industry should be invited by letter at least to join the Council, even if at present personal solicitation is not feasible.

An even lower percentage of our membership is enrolled in the National Safety Competition, namely, 27 per cent. Of the 73 per cent not enrolled, some of the reasons are as follows: Negligence, 10 per cent; do not believe that entry in the competition would be of assistance, 14 per cent; operations too small, 17 per cent. Other scattered reasons, each having a low percentage are: Too much clerical work entailed; not familiar with it; didn't know there was such a contest; safety organization too young to compete with credit; intend to join next year; not located in the United States.

As a respectful suggestion to those conducting the

National Safety Competition, it is worth consideration, in view of so high a percentage reporting their plants are not sufficiently large to be eligible, that it might be well to lower the requirements in this regard, as accidents occur in small plants as well as in large ones, and also possibly to render the Canadian producers eligible, as there are a number of members of the National Crushed Stone Association located in Canada.

Of those entered in the Competition, all replied that they had noticed increased interest in accident prevention as the result of the competitive spirit aroused in employees as the result of the competition.

In reply to the question "Do you believe that accident prevention and insurance should be made a major issue in the work of the National Crushed Stone Association?" 75 per cent replied affirmatively, commenting somewhat as follows: National Crushed Stone Association can put this across with quarry producers better than can the National Safety Council; believe that N. C. S. A. at next convention should adopt vigorous policy as to accident prevention; believe that N. C. S. A. should take hold of this issue and put it over in same thorough manner in which other Association matters have been handled.

The 25 per cent which are accredited with replying in the negative modify their vote by such comment as follows: Accident prevention only, omitting any reference to insurance rates; not necessarily a major issue, but given an important place in the affairs of the Association.

One producer who voted "no" replied that with the Associated General Contractors, the United States Bureau of Mines, the various insurance companies, the several state bureaus, the National Safety Council and other bodies all working on accident prevention, the subject is becoming over-emphasized and should not be handled by the Association. It is safe to conclude that there is an overwhelming preponderance of opinion in the crushed stone industry favoring the Association making accident prevention one of the major issues of Association affairs.

The pamphlet on "Safety Practices for Quarrying" prepared jointly by the Quarry Section of the National Safety Council and the Committee on Welfare and Safety of the National Crushed Stone Association has been of benefit to 75 per cent of those replying to the questionnaire. Ten per cent stated they had received no benefit and 15 per cent replied that they had not received a copy. There is a correlation of thought between the 15 per cent of the crushed stone industry not receiving a copy of this pamphlet and the membership in the Safety Council of 17 per cent not having

been solicited. Both of these conditions should be promptly rectified.

The request to "Describe briefly the manner in which safety matters are handled throughout your organization" received elaborate reply, into which it is hardly feasible to enter into detail. It is apparent, however, that those plants which have an intelligently planned and orderly operating safety organization have shown the greatest decrease in both the number and severity of accidents. Far too many replied in an indifferent, hazy manner, such as—"Believe in it myself and tell all of my men to be careful," "Insist that any man who isn't careful be fired," "Keep machinery in good order and expect men to handle it properly," etc. One executive operating only one plant goes so far as to state that he meets personally once a day with all of his employees and talks caution. If this is actually done it should achieve splendid results, but I am somewhat reminded of three women who were talking together, one of whom said, "In all the fifteen years of my married life my husband has not said a single cross word to me." The second woman replied, "My, I wish I could say that." The third one said, "Well, why don't you, she did."

It was also requested that the results of such accident work as is conducted be noted as to the number of accidents, the severity of accidents, the decrease in insurance rates and the improved morale of employees. Practically all of those who give any attention whatsoever to accident prevention, whether in a hit-or-miss manner or by orderly planning, reported that the spirit and morale of the employees was improved. The decrease in the severity of accidents and the number of accidents, as well as the decrease in insurance rates is more noticeable in the case of those companies which devote the most time and effort to accident prevention. Naturally this would be expected to be true and is merely confirmation of common opinion.

As to the chief difficulties encountered in conducting successful and effective accident prevention work, 7 per cent replied, "Lack of interest on the part of the employees" and 11 per cent, "The difficulty of overcoming characteristic carelessness of workers." Smaller percentages stated, "Getting the men to believe that we do not want them to get hurt even though we are insured" and "The difficulty of impressing upon superintendents and foremen that accidents are costly." In the case of 9 per cent the chief difficulty was the failure to secure proper cooperation from employees. This is a frank admission, but I am inclined to feel that the responsibility is the employer's rather than the employee's. Several replied that negro labor is indifferent



to such efforts in their behalf, as compensation for ten days for small cuts or bruises is extremely attractive. Those who have had experience in employing negro labor will recognize the truth of this observation.

Though it would seem that the answer to the last question of the questionnaire should be obvious, namely, "Do you conduct your accident prevention work from humanitarian motives or in order to reduce insurance rates, or both?" 18 per cent replied, "From humanitarian motives only," the remaining 82 per cent stating that both were considerations. As a matter of fact, a third reason could have been included in this question, namely, "Or for the purpose of increasing plant production?" This was not done because of my belief that the acceptance of the quarrying industry in general of the value of accident prevention work is not sufficiently advanced to readily understand and interpret such a suggested reason. It is highly probable that we do not place sufficient emphasis upon the fact that a safe plant is an efficient plant and that maximum production cannot be obtained without reducing preventable accidents to a minimum.

In reducing the number of preventable accidents, as in any other human activity, orderly planned, intelligent effort results in greater accomplishment than loose, slipshod, hit-or-miss methods. It is far from adequate for the manager or chief executive to earnestly desire to reduce accidents with a cautionary word or two every now and again to the employees as to being careful. In the crushed stone industry we have but to compare the latter type of effort to that of those plants in which accident prevention is a highly organized activity to realize the value that lies therein. Those members of the National Crushed Stone Association entered in 1925 and 1926 in the National Safety Competition have shown a marked improvement in the latter year over the former. In 1925 the accident rate of those plants entered in the Competition was 6.7 days lost per thousand man hours of exposure as against 6.0 in 1926, and an accident frequency rate per million man hours of 61 in 1925 as against 41 in 1926. This indicates an improvement of 10 per cent in the accident severity rate and 33 per cent in the accident frequency rate. These figures relate to 38 quarries in 1925 and 37 in 1926 and are furnished through the courtesy of Mr. Adams, Supervising Statistician of the Accident Statistics Section of the Bureau of Mines. It is to be regretted that the number of quarries entered did not show marked increase in 1926 over 1925.

Improvement equally encouraging and gratifying has been made by those quarries holding membership in

the National Safety Council. In fact, it is largely true that practically all quarries entered in the National Safety Competition are members of the National Safety Council.

An analysis of the questionnaire submitted to the quarry industry tends to confirm another conclusion of the Committee on Safety and Production of the American Engineering Council, previously referred to, that the accident and production performance of the best plants in each industry clearly shows that tremendous improvements can be achieved by the remaining plants in each industry. As a corollary, it might be stated with equal truth that the accident and production performance of one industry should encourage other industries to achieve similarly successful results.

The experience of the Portland Cement Association in the reduction of accidents is inspiring and encouraging. In June of this year 164 cement plants employing 45,000 workers participated in a no-accident drive. It is almost amazing to know that accidents dropped 75 per cent during this month as compared with June of a year ago. During the June drive of this year 50 lost-time accidents occurred as against 192 during the same period last year. Only one man lost his life in June of this year as compared with six in June of 1926. To endeavor to explain such a marked improvement in corresponding months of two succeeding years as a mere coincident is futile and absurd. Such improvement can only be attributed to the intensive drive of the Cement Association to reduce accidents.

In other industries almost equally great improvement can be shown over periods of intensive accident prevention work as compared to similar periods during which no such campaign was in progress. For the sake of humanity in general and a lowering of production costs, it is encouraging to realize that various industries, through their national associations, are giving increasing attention to the value of this work. The Associated General Contractors of America, alert as they are to improved methods of construction and lowering of costs, are, through their association, entering intelligently into this worth-while field.

In the transmutation of an unsafe plant or factory to a safe and consequently more efficient one, certain fundamental principles must be followed, however much the detail of their execution be varied. First, the responsible executive must recognize the several values of accident prevention effort and conceive the intention of improving conditions. Second, his recognition of such values must be transmitted throughout the organization until every man is reached. Third,

(Continued on page 16)

# Tests on Stone Screenings as a Fine Aggregate in Concrete

**I**N SOME localities natural sand either is not procurable or is of a very poor quality unfit for use in concrete. In these localities screenings resulting from the crushing of rock generally are available as they are also in many places where natural sand abounds. Accordingly, the use of screenings in concrete in lieu of natural sand, or in combination with natural sand, frequently comes before engineers for their consideration.

Natural sand has been the most universally used of all fine aggregates and concrete workers are therefore much more fully acquainted with its characteristics than with stone screenings. Their familiarity makes them much more willing to use natural sand than what to them is an untried product, of whose results they are uncertain. The following test data on stone screenings indicate that this material does make suitable concrete, often times concrete of exceedingly high quality. The included information is taken in part from a report on the subject of stone screenings submitted to the Committee on Tests of the American Association of State Highway Officials in 1925 and kindly make available for the use of this Association several months ago.

The report to the Committee on Tests of the A. A. S. H. O. is lengthy and of necessity must be presented in brief form. The essential features, however, will be included as completely as possible. It is made up of individual reports by several highway departments including Illinois, Minnesota, New Hampshire, Oregon, and West Virginia.

## Report of the Illinois Highway Laboratory

The screenings tested in comparison with natural sand were made from rock having the following characteristics:

Per cent wear	= 5.8
Toughness (with grain)	= 5.0
Toughness (across grain)	= 6.0
Hardness	= 15.8
Per cent absorption	= 1.5
Specific Gravity	= 2.60

The tests were made on 1:2 mortar with both stone screenings and natural sand, both of these materials complying with the specifications of the Illinois State

Highway Department. Wear tests were also made, the surface of the specimens being subjected to abrasion in a special machine designed for this purpose. The following discussion and conclusions are quoted directly from the report:

### Discussion

"Figures 2 and 3 reveal the fact that the transverse strength of 1:2 mortar made from stone screenings is higher at 14 and 28 days than that of natural sand. These specimens were 6 inches x 8 inches x 30 inches, cured in a moist closet.

"Figure 4 shows that the compressive strength of 4.5 inch x 6 inch cylinders drilled from transverse specimens are higher for stone screenings than for sand at 14 and 28 days.

"Figure 5 shows that the compression strength of 2-inch x 4-inch cast cylinders of sand are higher than stone screenings, although in Figures 6 and 7 the stone screenings show the higher compressive strength for 21 and 28 days.

"Figure 8 reveals an interesting fact in the difference between the wearing qualities of sand and stone screenings mortar in which no method of curing was used. This is undoubtedly due to the ability of the stone screenings to hold water and gradually give it up to the cement, thus assuring a more complete hydration to the cement in the stone screenings specimens than to the cement in the sand specimens which had no such moisture available. When wet dirt is used as a curing medium the relative difference of wear is reduced although the stone screenings continue to show less wear.

"Figure 9 which reveals the results of the standard Deval Wear Machine verifies the results in Figure 8 on the effect of air curing on the specimens. The stone screenings specimens show by far the less wear.

"Figure 10 shows also the constant curing effect on the specimens as there is less difference noted, but again the stone screenings are slightly the better."

### Conclusions

"From the results obtained so far in this investigation it appears that stone screenings do not weaken

<sup>1</sup>Note: Lack of space has prevented publication of the figures to which reference is made.





Sawed Face of Core Drilled from Concrete Pavement—Showing Texture of Concrete in Which Stone Screenings Were Used.

the strength of 1:2 volumetric mortar as compared with a suitable commercial sand, and that stone screenings compare very favorably with sand as far as their relative resistance to abrasion or wear, is concerned. The necessity of close observation on the amount of dust and the prevention of shipments during rainy weather are vital considerations. The results of the long time concrete and mortar tests will undoubtedly give more reliable and conclusive data. As suggested by the variation in source of material there is the need of comparing stone screenings from rocks of varying hardness both for compression and transverse strengths and for the relative shrinkage due to varying atmospheric conditions. This latter phase of the subject is being outlined as an investigation project for this winter. Samples have been received from three states and to these other samples will be added before the test is completed.

"The use of stone screenings was permitted in one instance on a force account job this past construction season and the strength of the Calyx cores drilled from

the pavement show strengths as high as those in which sand was the fine aggregate used. The results of the compression test of Calyx cores on two state jobs placed last year also reveal a satisfactory strength.

"In conclusion it may be said that as far as the nature and type of stone screenings that we have used on practical jobs and tested in the laboratory, in Illinois there has been no undue risk taken as the strength and service results are comparable to those in which sand was used as a fine aggregate. Before this material can be used on a job, it must have the approval of the engineer in charge."

### Minnesota Tests

The Minnesota Tests were made under the direction of Mr. F. C. Lang of the Minnesota State Highway Department and included screenings resulting from the concentration of iron ore from the Mesabi Iron Mine, Babbitt, Minnesota, in comparison with natural sand. Photomicrographs taken of the screenings are stated

to have shown them to be structurally weak. Without going into the details of the tests and test results the following discussion and conclusion are quoted from the report.

### Discussion

#### A. Sand.

"The grading of rock crushings or sand which gives the greatest density is as follows:

Passing ¼ inch screen.. 100 %	Passing No. 50 sieve.... 18.4%
Passing No. 10 sieve.... 60 %	Passing No. 100 sieve.... 4.0%
Passing No. 20 sieve.... 42.9%	

"This grading probably should be altered somewhat as follows, in order to make it more workable:

Passing ¼ inch screen.. 100%	Passing No. 50 sieve.... 15%
Passing No. 10 sieve.... 70%	Passing No. 100 sieve.... 2%
Passing No. 20 sieve.... 50%	

"A close inspection of the sand shows that it is structurally weak. A large amount of the sand grains are flat and elongated in shape and many of these grains are easily broken with the hands. A number of the sand grains were set in sealing wax and ground down on a carborundum wheel to give a polished surface. Under the microscope these sand grains appeared to have small cracks or incipient fractures. These fractures are probably caused by the crushing of the rock at the plant.

#### B. Concrete Cylinders.

"Table No. 8 shows the results of compression tests on cylinders in which Babbitt rock was used as coarse aggregate and sand (\*) was used as fine aggregate. From the table it appears that the jiggling had no tendency to reduce the compressive strength of the concrete. No visible signs of segregation or settling could be found in the broken cylinders.

"Table No. 9 shows the compression tests on cylinders in which Babbitt rock was used as coarse aggregate and Babbitt crushings were used as fine aggregate. Comparing this table with Table No. 8 will show that this concrete is 1,000 lbs. weaker per square inch than the concrete in which (\*) sand was used. This series bears out the statement made earlier in this discussion that the sand is structurally weak.

"From Table No. 7 it may be seen that the cylinders in which the Babbitt sand was used required 100 more water to produce a workable mix than the cylinders in which (\*) sand was used. This difference in water content probably caused some of the difference in strength.

\*Note.—Original report gives the name of the sand.

### Conclusion

"From the foregoing it may be concluded that the coarse rock from Babbitt, that is, the material above a quarter inch in size, will make very good material for coarse aggregate in concrete paving work.

"Owing to the apparent weakness by the materials below ¼-inch screen and to the fact that the Babbitt sand requires much more water for a workable mix it would seem unadvisable to use it as fine aggregate in concrete paving work in localities where it is possible to secure a natural sand of acceptable quality."

### New Hampshire Investigation

This investigation included two kinds of stone screenings, limestone from Illinois and granite from New Hampshire. The coarse aggregate was trap rock. The results are very meagre and both the limestone and granite screenings gave satisfactory strengths. They cannot be compared for different brands of cement were used. At 28 days, however, one averaged well over 2000 lbs. and the other well over 2700 lbs. per sq. in.

### Oregon Investigations

An abstract of this report is quoted in full herewith.

#### Use of Stone Screenings With Natural Sand as Fine Aggregate in Concrete by the Oregon State Highway Commission

"Without going into the geological reasons, the fact remains that certain areas of Oregon are practically devoid of a concrete sand which will pass the requirements of the specifications, and give 100% in compression and tension when compared to Ottawa standard sand. It became necessary, therefore, to so sweeten these poor sands by the addition of screenings, that the mixture passes the specification for strength.

"The sources of these screenings have of course varied. In general the better, that is the harder and more wear resisting the raw material, be it rock or gravel, the better the resultant screenings. Screenings from basaltic rock and rolled pea gravel have been used as the source of supply. This represents about the two extremes. The basaltic rock yields the highest test material obtainable, and the pea gravel about the poorest, yet the pea gravel screenings, poor as they are, generally run from 135% to 160% standard. By requiring the rolls to be properly set, not over 10% or 15% of the resultant material is retained on the No. 4 mesh sieve.



—Photo by J. K. Hillers

Concrete Stadium at Ohio State University, Columbus,  
in Which Stone Screenings Were Used.

"The results of using the various screenings in concrete pavement have been followed with a great deal of interest. Most of the screenings carry from 10% to 20% of dust passing the 100-mesh sieve. When the screenings are made from a hard material, up to 15% of this dust does not seem to have any noticeable deleterious effect on the concrete. For example a one-half mile strip of pavement was laid in a locality in which the streams carried insufficient sand although of very good grade. The use of a fine aggregate composed of one-half natural sand and one-half fine screenings was permitted.

"On fifteen 6-inch x 12-inch cylinders, 28 days old, using a 1:2:3 mix, a compressive strength of 3723 pounds per square inch was obtained. The screenings used were very fine, containing about 20% rock dust. For the past few months no close inspection has been given this pavement but prior to this time no cracks or breaks were known to have occurred.

"Screenings from rolled pea gravel, added to rather weak sands, in amounts varying up to 50%, have been used in laying different stretches of pavement and while

some of these jobs did not stand up as well as others, it is thought other conditions were responsible for the failures.

"From the experience in Oregon, it is concluded that the use of screenings containing not more than 15% passing the 100-mesh screen and not more than 15% retained on the No. 4-mesh screen is advantageous in amounts up to 50% of the fine aggregate to increase its strength. On account of the difficulty in finishing, it is thought that it would be impracticable to use screenings alone as the fine aggregate although they have never been tried."

### West Virginia Investigations

These investigations were made on limestone screenings submitted by the State of Illinois, on Ottawa sand such as used for test purposes and two natural sands.

The following results are quoted from the report.

#### Report on Stone Screenings

"The data tabulated herein is the result of a comparison test of limestone screenings submitted by the



State of Illinois, Department of Public Works and Buildings, Division of Highways (H. F. Clemmer) and three sands, Standard Ottawa, (\*) and (\*) sand. The mix used was 1:3. Amount of water used was determined by the flow using the Standard Ottawa sand as a standard. Size of compression specimens 2-in. x 4-in.

\*The original report gives the name of the sand.

TABLE I.—MECHANICAL ANALYSES

Limestone screenings No. 2.		Sand No. 3		No. 4	
Retained on ¼ inch	2.87%	0.0%	0.0%		
Passing ¼ inch, retained No. 10	27.9	1.1	18.8		
Passing No. 10, retained No. 20	33.5	6.9	18.2		
Passing No. 20, retained No. 30	16.7	46.9	21.1		
Passing No. 30, retained No. 40	6.9	22.4	15.2		
Passing No. 40, retained No. 50	4.7	8.9	12.4		
Passing No. 50, retained No. 80	4.4	7.5	9.4		
Passing No. 80, retained No. 100	1.5	2.9	2.3		
Passing No. 100, retained No. 200	1.9	2.4	1.6		
Passing No. 200	2.5	1.0	1.0		
Total	100.0	100.0	100.0		

TABLE II.—COMPRESSIVE STRENGTH RESULTS 1:3 MORTAR  
Ottawa Sand—No. 1

Serial No.	Amount of water in gms.	Flow	7-Day results	Aver- age	14-Day results	Aver- age	28-Day results	Aver- age
01	150	9	1815		2070		2550	
			1695		2170		2610	
			1615		2010		2540	
			1515		2080		2670	
			1625	1655	2070	2080	2620	2598
02	150	9	1520		1990		2370	
			1615		2000		2530	
			1545		2020		2510	
			1535		2110		2590	
			1585	1560	2030	2030	2370	2474
03	150	9	1435		1880		2620	
			1760		1930		2540	
			1415		1880		2500	
			1360		1870		2600	
			1675	1527	2040	1920	2590	2570
Average of 15 cylinders				1581		2010		2547

Limestone Screenings—No. 2

L1	190	9	1950		3150		4000	
			2020		3270		3670	
			2120		2010		3680	
			2030		3070		3710	
			2150	2054	3000	3100	3990	3810
L2	190	9	2275		2850		3770	
			2555		2850		4135	
			2200		2790		3900	
			2210		2930		4025	
			2330	2314	3050	2894	3940	3934
L3	190	9	2500		3330		4070	
			2500		3430		4030	
			2570		3200		4270	
			2130		3190		4170	
			2310	2470	2960	3222	4080	4124
Average				2279		3072		2956
Strength ratio				144		153		155

Sand—No. 3

Serial No.	Amount of water in gms.	Flow	7-Day results	Aver- age	14-Day results	Aver- age	28-Day results	Aver- age
D1	180	9	1410		1755		2370	
			1415		1820		2330	
			1325		1775		2490	
			1310		1775		2370	
			1425	1377	1785	1782	2550	2422
D2	180	9	1465		2000		2580	
			1470		1785		2650	
			1475		1980		2710	
			1445		1720		2570	
			1505	1472	1765	1850	2770	2656
D3	180	9	1560		2100		2610	
			1510		2060		2470	
			1415		2140		2640	
			1715		2000		2520	
			1465	1533	1940	2048	2470	2542
Average				1461		1893		2540
Strength ratio				92		94		99

Sand—No. 4

R1	165	9	2030		2450		2950	
			2180		2470		3070	
			1890		2570		2880	
			1995		2610		3230	
			1970	2013	2560	2532	2950	2016
R2	165	9	2050		2550		3360	
			2000		2610		3570	
			2090		2690		3230	
			2050		2450		3240	
			2070	2052	2530	2566	3260	3326
R3	165	9	2180		2520		3520	
			2510		2800		3510	
			2010		2320		3610	
			2220		2430		3470	
			2430	2270	2730	2560	3640	3550
Average				2112		2533		3297
Strength ratio				134		127		130

Ottawa Sand

Serial No.	Amount of water in gms.	Flow	3-Mos. results	Aver- age	6-Mos. results	Aver- age	1-Yr. results	Aver- age
O4	150	4	2660		1984			
			2850		1942			
			2800		2324			
			2790		2006			
			2970	2810	2053	2081		

Limestone Screenings

L4	190	4	5210		4011		
			4960		5045		
			4460		4966		
			4775		4474		
			4670	4815	3820	4463	
Strength Ratio				171		215	

Sand—No. 3

D4	180	4	3220		2832	
			3060		3088	
			3130		2578	
			3180		2881	
			3045	3127	2865	2849
Strength Ratio				111		137

TABLE II—COMPRESSIVE STRENGTH RESULTS 1:3 MORTAR

(Continued)

Sand—No. 4

Serial No.	Amount of water in gms.	Flow	3-Mos. results	Aver. age	6-Mos. results	Aver. age	1-Yr. results	Aver. age
R4	170	4	3360		3581			
			3780		3517			
			3500		3501			
			3620		3581			
			3540	3560	3501	3536		
Strength Ratio			127		170			

*Note by the Bureau of Engineering*

In the above tables it will be noted that the limestone screenings gave exceptionally high compressive strengths at all ages, including six months and far higher than the two natural sands and the Ottawa sand used for comparison. The report also includes tests on limestone screenings from another source which also gave exceptionally high results in comparison with Ottawa sand as follows:

Age	Ottawa Sand	Limestone Screenings	Special Grading Limestone Screenings
7 days	1731	3574	3608
14 days	2186	4402	4198
28 days	2515	4985	4691
3 mos.	2948	5862	5124
6 mos.	2971	5297	4271

The gradings of the limestone screenings used in these tests were as follows:

	Limestone Screenings	Special Grading Limestone Screenings
Retained on No. 100.....	94.3	95.2
Retained on No. 48.....	91.6	86.5
Retained on No. 28.....	87.7	67.8
Retained on No. 14.....	79.7	44.9
Retained on No. 8.....	60.7	22.8
Retained on No. 4.....	5.1	0.8

Again it will be noted that the limestone screenings gave very good results, far in excess of the Ottawa strength results. This, of course, is not truly indicative of the value of screenings for use in concrete but none the less indicates them to be structurally sound and in this sense suitable for use as a fine aggregate.

**Mortar Compression Tests on Virginia Limestone Screenings, Washed and Unwashed**

"The purpose of this test was to determine the suitability of limestone screenings as used for fine aggregate in cement concrete. This test was run in two series. The first series was mixed as received from the plant with the exception that the material above the 1/4-inch was removed. In the second series the 1/4-inch material was removed and the aggregate washed, removing part of the 200-mesh material."

## MECHANICAL ANALYSIS OF MATERIAL

## Screenings Unwashed

Retained on 1/4-inch.....	14.8%
Passing 1/4-inch sieve, retained on No. 10.....	50.6%
Passing No. 10, retained on No. 20.....	23.1%
Passing No. 20, retained on No. 30.....	7.7%
Passing No. 30, retained on No. 40.....	2.7%
Passing No. 40, retained on No. 50.....	1.9%
Passing No. 50, retained on No. 80.....	1.9%
Passing No. 80, retained on No. 100.....	1.1%
Passing No. 100, retained on No. 200.....	2.2%
Passing No. 200.....	8.8%

Total..... 100.0%

## Screenings Washed

Passing 1/4-inch sieve, retained on No. 10.....	56.0%
Passing No. 10, retained on No. 20.....	23.0%
Passing No. 20, retained on No. 30.....	7.6%
Passing No. 30, retained on No. 40.....	2.8%
Passing No. 40, retained on No. 50.....	2.0%
Passing No. 50, retained on No. 80.....	2.0%
Passing No. 80, retained on No. 100.....	1.3%
Passing No. 100, retained on No. 200.....	2.1%
Passing No. 200.....	3.2%

Total..... 100.0%

*Note by the Bureau of Engineering*

It is to be noted below that limestone screenings showed unusually high strengths in spite of the fact that far more water was used with them than in the case of the Ottawa sand.

## COMPARISON OF COMPRESSIVE STRENGTHS AT DIFFERENT AGES

Age	Standard Ottawa Sand	Virginia Screenings Washed	Ottawa Sand	Virginia Screenings Unwashed
7 days	1799	2523	1908	3479
14 days	2160	3002	2445	4244
28 days	2556	3981	2732	4716
3 mos.	3345	4620	3145	5266
6 mos.	3530	5817	3759	7313
Water Used	150 gms.	175 gms.	150 gms.	180 gms.

**Compression Tests on 6-inch x 12-inch Concrete Cylinders, Using Virginia Limestone Screenings and Ohio River Sand as Fine Aggregates and Limestone as Coarse Aggregate**

"The purpose of this test was to make a comparison between the compressive strength of concrete cylinders using Ohio River Sand and Virginia Limestone Screenings as fine aggregate.

## ANALYSIS OF MATERIAL

## Ohio River Sand

Passing 1/4-inch sieve, retained on No. 10.....	3.2%
Passing No. 10, retained on No. 20.....	16.0
Passing No. 20, retained on No. 30.....	22.7
Passing No. 30, retained on No. 40.....	23.3
Passing No. 40, retained on No. 50.....	10.5
Passing No. 50, retained on No. 80.....	12.4
Passing No. 80, retained on No. 100.....	2.3
Passing No. 100, retained on No. 200.....	1.0
Passing No. 200.....	8.6

100.0%

## ANALYSIS OF MATERIAL—(Continued)

## Virginia Limestone Screenings

Retained on 1/4-inch screen.....	14.8%
Passing 1/4-inch sieve, retained on No. 10.....	53.8
Passing No. 10, retained on No. 20.....	26.8
Passing No. 20, retained on No. 30.....	8.2
Passing No. 30, retained on No. 40.....	2.7
Passing No. 40, retained on No. 50.....	2.0
Passing No. 50, retained on No. 80.....	1.1
Passing No. 80, retained on No. 100.....	1.8
Passing No. 100, retained on No. 200.....	1.7
Passing No. 200.....	1.9

100.0%

Note.—The above analysis was run after washing. The per cent passing No. 200 before washing was 8.8.

"The above grading of Virginia Limestone Screenings did not give a dense concrete nor did it work well. Several cylinders mixed with the screenings and crushed limestone were full of air pockets and pitted. For this reason the Virginia Limestone Screenings were mixed with a finer material which gave the following sieve analysis."

Passing 1/4-inch sieve, retained on No. 10.....	33.0%
Passing No. 10, retained on No. 20.....	30.3
Passing No. 20, retained on No. 30.....	12.2
Passing No. 30, retained on No. 40.....	5.1
Passing No. 40, retained on No. 50.....	3.7
Passing No. 50, retained on No. 80.....	4.2
Passing No. 80, retained on No. 100.....	2.3
Passing No. 100, retained on No. 200.....	4.2
Passing No. 200.....	5.0

100.0%

## GRADING OF COARSE AGGREGATE

Passing 1 1/2-inch screen, retained on 1-inch.....	32.1%
Passing 1-inch screen, retained on 3/4-inch.....	10.9
Passing 3/4-inch screen, retained on 1/2-inch.....	31.0
Passing 1/2-inch screen, retained on 1/4-inch.....	26.0

100.0%

## RESULT OF COMPRESSION TESTS ON CONCRETE CYLINDERS USING CRUSHED LIMESTONE AS COARSE AGGREGATE AND OHIO RIVER SAND AS FINE AGGREGATE.

Serial Nos.	Mix.	Total load in pounds 28 days	Compressive Str. lbs./sq. in. 28 days	Average 28 lbs./sq. in. days	Total load in pounds 6 months	Compressive Str. lbs./sq. in. 6 mos.	Average 6 mos. lbs./sq. in.
VAL		108,000	3820		152,500	5400	
1-9	1:4 1/2	126,300	4460	4293	193,600	6540	6105
		130,000	4600		166,400	5875	
VAL		107,200	3790		118,300	4180	
11-19	1:6	104,000	3680	3753	147,400	5210	4670
		107,000	3790		130,800	4620	
VAL		56,500	2000		89,800	3180	
21-29	1:7 1/2	66,100	2340	2157	89,400	3150	3165
		60,200	2130		135,500	4795	
VAL		49,100	1735		108,400	3840	
31-39	1:9	45,100	1600	1698	69,400	2450	2485
		43,000	1520		71,450	2520	

The above mixes are: 1:4 1/2 or 1:1 1/2:3; 1:6 or 1:2:4; 1:7 1/2 or 1:2 1/2:5; 1:9 or 1:3:6. The slump was 1 inch for all mixes.

## RESULT OF COMPRESSION TESTS ON CONCRETE CYLINDERS USING VIRGINIA LIMESTONE SCREENINGS AS FINE AGGREGATE AND LIMESTONE AS COARSE AGGREGATE.

Serial Nos.	Mix.	Total load in pounds 28 days	Compressive Str. lbs./sq. in. 28 days	Average 28 lbs./sq. in. days	Total load in pounds 6 months	Compressive Str. lbs./sq. in. 6 mos.	Average 6 mos. lbs./sq. in.
VAL		126,700	4475		189,000	6675	
41-49	1:4 1/2	113,000	4000	4202	138,000	4870	5010
		117,000	4130		145,600	5150	
VAL		65,150	2310		135,500	4780	
51-59	1:6	94,180	3330	3200	126,700	4470	4625
		86,730	3070		99,500	3520	
VAL		70,000	2470		71,600	2530	
61-69	1:7 1/2	76,300	2700	2585	94,600	3340	3185
		54,150	1915		85,800	3030	
VAL		32,500	1150		57,600	2035	
71-79	1:9	40,300	1425	1475	101,600	3590	2047
		43,100	1525		58,400	2060	

The above mixes are: 1:4 1/2 or 1:1 1/2:3; 1:6 or 1:2:4; 1:7 1/2 or 1:2 1/2:5; 1:9 or 1:3:6. The slump was 1 inch for all mixes.

## Note by the Bureau of Engineering

In the compressive strengths given above for concrete of different mixes, the concrete made with limestone screenings is considered as of highly satisfactory quality. In some cases it is higher in strength than the concrete made with sand as a fine aggregate and in other cases lower. This is of no practical significance; the strength depends so much upon the grading of the fine aggregate and other characteristics.

Perhaps enough test results have been shown in the foregoing series to point very strongly to the fact that highly satisfactory strengths may be obtained with limestone and other screenings used as a fine aggregate in concrete. Just as in the case of natural sand the screenings should be limited so that they will contain no deleterious matter and will be properly graded to produce workable and dense concrete.

## JANUARY CONVENTION CALENDAR

Official announcements of the dates and meeting places of conventions of interest to the industry have been made as follows:

**National Sand and Gravel Association**  
Convention and Exposition of Equipment and Machinery  
Detroit—January 4, 5 and 6.

**American Road Builders' Association**  
Convention and Road Show  
Cleveland—January 9 to 13.

**National Crushed Stone Association**  
Convention and Exposition of Quarry Equipment and Machinery  
West Baden, Indiana—January 16, 17, 18 and 19

**Associated General Contractors**  
Convention and Construction Exposition  
West Baden, Indiana—January 23 to 27.



## Crushed Stone and Gravel Producers in Southwest to Have Joint Case in Interstate Commerce Commission Investigation

WITH a full appreciation of the importance and possible far-reaching effect of the recent order of the Interstate Commerce Commission, which called for an investigation into the present rates on crushed stone, sand and gravel in Southwestern territory, the producers of these materials held a joint meeting at the Adolphus Hotel, Dallas, Texas, on September 9, to discuss plans relative to the best possible preparation and presentation of their case before the Commission.

Preliminary to the joint meeting, each group held a meeting of its own, discussing very thoroughly the advisability of preparing a joint case. Both groups most heartily subscribed to this idea and the two meetings were therefore merged into one to consider plans for a joint procedure.

R. J. Potts, President of the Potts-Moore Gravel Company of Waco, Texas, was elected Chairman of the meeting.

Each producer present was given an opportunity to express his views as to what plan of action was best suited to protect the interests of the industry in the forthcoming investigation. It was evident from the very beginning of the discussion that everyone was in agreement as to the wisdom of making a joint presentation and particularly in view of the fact that stone and gravel in this territory now move under the same rates and whatever adjustment was made would apply in like measure to both commodities. Such a procedure would also have the additional advantage of permitting a coordination of effort in assembling data and preparing exhibits for presentation to the Commission which would justify a scale of rates on these commodities in Southwestern territory which would be reasonable and just.

The meeting was very well attended and represented a decided majority of the stone and gravel producers in Southwestern territory. There were also included a number of well-informed traffic managers whose advice proved valuable in formulating a plan of procedure.

An interesting feature of the discussion was contributed by J. A. Coffey, General Traffic Manager, Missouri Portland Cement Company, St. Louis, in which he laid particular stress on the influence which

the Hoch-Smith Resolution would exert in the Southwestern investigation. He ventured the prophecy that this investigation was but the beginning and that similar investigations might be expected in other parts of the country covering not only stone and gravel, but also cement, and other basic commodities.

A summary of the traffic situation in Texas was made by F. E. Bolte, Dallas Washed and Screened Gravel Company, Dallas. He called attention to the fact that prompt and definite action should be taken to properly protect the interests of the industry.

Speaking for the stone producers, W. F. Wise, President of the Stringtown Crushed Rock Company, McAlester, Oklahoma, and President of the Southwestern Division of the National Crushed Stone Association, stated that the members of his industry would gladly cooperate with the gravel producers in the presentation of a joint case and a plan of sharing expenses suggested by him was accepted by the gravel producers.

A number of others contributed to the discussion, including J. M. Chandler, Price Sand Company, Tulsa, Okla.; E. Eikel, Dittlinger Lime Company, New Braunfels, Texas; E. A. Starr, Thurber Earthen Products Co., Ft. Worth, Tex.; R. M. Quigley, President, Texas Sand and Gravel Producers Association. All of these gentlemen were in favor of a joint presentation and pledged their support in carrying out the wishes of the meeting.

A very interesting presentation of the situation in Western Louisiana was given by Fordyce Kimbell who represented shippers in that section. Mr. Kimbell stated that he did not believe the present basis of rates in Western Louisiana would be disturbed for the present by the Commission and that the Louisiana Highway Department would lend its aid to the state producers in the presentation of the case.

As soon as it was definitely determined that the meeting was in favor of a joint presentation, it was pointed out that a petition should immediately be forwarded to the Interstate Commerce Commission requesting a postponement of the hearings set for October 31 to a later date as it would be impossible in the limited time now available to prepare an intelligent and comprehensive case.

A committee was therefore appointed to draft a telegram for the signatures of the National Sand and Gravel Association and the National Crushed Stone Association, asking the Commission for an extension of time. The following message was prepared by the committee, approved by the meeting and immediately dispatched to the Commission:

As representatives of the sand, gravel and crushed stone industries of Texas, Oklahoma, Arkansas, and Western Louisiana, assembled today in Dallas, we respectfully request that the Interstate Commerce Commission postpone the hearings to be conducted under Docket seventeen thousand, part eleven, involving an investigation into existing rates on our commodities in Southwestern Territory. The limited time at our disposal before the hearing scheduled for October thirty-first renders it practically impossible to properly prepare and present our case and it is our earnest hope that this request for reasonable postponement will meet with your approval. Our associations are in sympathy with the apparent purpose of your Commission to stabilize and make uniform rates on sand, gravel, crushed stone and related commodities in the Southwest, and it is with this in mind that we are requesting an extension of time in order to permit us to prepare sufficient data to be of assistance in reaching a just and equitable solution of the case. Our representatives will call upon you in Washington next week for purpose further discussion of matter and final decision in premises.

Inasmuch as the state commissions will sit with the Interstate Commerce Commission in the hearings, a copy of this telegram was sent to the railroad commissions of Texas, Arkansas, Oklahoma and Louisiana asking their cooperation in obtaining a postponement of the hearings.

The next important step taken by the meeting was the appointment of a steering committee which was delegated the duty of retaining counsel and assisting in the collection of the necessary data.

Just before the close of the meeting, Mr. Wise introduced resolutions expressing the appreciation and thanks of the meeting for the splendid luncheon which was provided by the gravel producers of Dallas and Fort Worth and thanking the Adolphus Hotel for the facilities which were made available for the meeting and conferences.

There is given below a list of those in attendance at the meeting:

- E. N. Adams, Tulsa Traffic Association, Tulsa, Okla.
- V. P. Ahearn, National Sand and Gravel Association, Washington, D. C.
- Mas Altgelt, New Braunfels Limestone Company, New Braunfels, Texas.
- F. E. Bolte, Dallas Washed and Screened Gravel Company, Dallas, Texas.
- H. P. Bonner, Ft. Worth Sand and Gravel Company, Fort Worth, Texas.

J. R. Boyd, National Crushed Stone Association, Washington, D. C.

W. W. Carson, Jr., Texas Sand and Gravel Producers Association, Austin, Texas.

J. M. Chandler, Hughes Stone Company, Tulsa, Okla.

Nolan Clark, Gifford-Hill and Co., Inc., Dallas, Tex.

J. A. Coffey, Missouri Portland Cement Company, St. Louis, Mo.

G. H. Cope, Delese Bros., Oklahoma City, Okla.

E. C. Dodson, Chico Stone Products Co., Dallas, Tex.

Mr. Edmonson, West Point Co., West Point, Tex.

E. Eikel, Dittlinger Lime Co., New Braunfels, Tex.

F. H. Gades, Consumers Sand and Gravel Company, Topeka, Kans.

W. H. Gemmer, Gemmer & Tanner, Houston, Texas.

P. W. Gifford, Gifford-Hill & Co., Inc., Dallas, Tex.

A. S. Goetz, Thurber Earthen Products Company, Fort Worth, Texas.

R. J. Hank, Southwestern Division, National Crushed Stone Association, Austin, Texas.

Dan Harston, Trinity Gravel Co., Dallas, Tex.

Fordyce Kimbell, Representing: Traffic Manager Jahncke Service Bureau, New Orleans, La.; V.-P., North American Company, Shreveport, La.; Clements-Braswell Company, Minden, La.; Brushy Gravel Company, Minden, La.; Reader Gravel Company, Reader, Ark.

J. H. Knox, Consulting Engineer, Dallas, Texas.

Frank Leffingwell.

J. L. Lively, Jacksboro Stone Products Company, Jacksboro, Texas.

J. McStevenson, Hillsdale Gravel Company, Sweetwater, Texas.

Rhea Miller, J. Fred Smith Gravel Company, Dallas, Texas.

H. Y. Murff, Murff Bros., Dallas, Texas.

T. J. Palm, Texas Sand and Gravel Company, Waco, Texas.

Robert J. Potts, Potts-Moore Gravel Company, Waco, Texas.

R. M. Quigley, Fort Worth Sand and Gravel Company, Fort Worth, Texas.

E. A. Starr, Thurber Earthen Products Company, Fort Worth, Texas.

L. W. Wells, Jr., Midland Sand and Gravel Company, Terrell, Texas.

C. Westbrook, Landa Rock Products Company, New Braunfels, Texas.

W. F. Wise, Stringtown Crushed Rock Company, McAlister, Okla.; Texas Trap Rock Corporation, San Antonio, Texas.

# Making a Friend of Your Banker<sup>1</sup>

BY HUGH M. DRISCOLL

*Manager, Credit Department, Boulevard Bridge Bank, Chicago, Ill.*

TO MANY a business man, able and experienced in his own line, the ways and workings of his bank are a mystery. But there should be no mystery about a bank. In its fundamental relations there are only two functions of a bank—the deposit function and the loan function. A bank receives the deposits of its customers and it loans these deposits out to other customers.

The main duties of a bank are simple, but the variety and detail of the operations performed are infinite in number and highly specialized in their departments. They do not, however, interest the ordinary depositor. The thing that does interest him is the borrowing of funds for his needs and the methods of repaying these funds. There are a few main facts surrounding this relationship that, when thoroughly understood, would be conducive to a most happy relationship between banker and borrower.

It is in the very nature of a bank loan that it shall be paid within a reasonable time. What constitutes a reasonable time depends on the particular circumstances, but as a rule, this varies from thirty days to eight or nine months. A line of credit is no more than permission to borrow up to a certain limit at any time without discussing the particular transaction necessitating each loan, but even a line of credit should be liquidated at least once a year and should remain clean for two or three months. The payment of a loan, according to the terms agreed upon, or according to good banking practice, demonstrates two things: First, that the business is well managed and well budgeted and that income is up to expectations; second, in case of reverses of any kind, payment of outstanding loans shows that the business is sound enough and healthy enough to liquidate its liabilities without undue strain. If a loan cannot be paid at maturity it is usually an evidence of something unsound, either in the management, or in the capital structure.

If the borrower, in dealing with his bank, keeps in mind the above points he will find it much easier to understand the attitude of his banker. In addition, it must be remembered that a bank makes money by the rapid turnover of the funds with which it works.

It cannot afford to have any of its capital or cash resources tied up in long term investments and when a loan, even though based on good collateral, runs for a lengthy period of time it is technically "frozen." When a large proportion of a bank's loans are "frozen," we have the situation in which so many of our mid-western banks have found themselves during the past few years.

Another point that borrowers sometimes resent a little is the fact that their banker will ask so many questions, some of them apparently trivial, and will make such a searching investigation for what may amount to a very small loan. It should be borne in mind that the science of banking has developed a number of fundamental rules which may be applied to almost every prospective loan. By securing certain specified facts, the banker is enabled to apply a sort of mechanical measure to the average proposition which gauges roughly, so to speak, its size, weight and thickness. Other special information will enable him to make up his mind with a very considerable degree of accuracy concerning the soundness and desirability of the loan. In addition to all this, the more familiar a man is with the details surrounding any given proposition, the more intelligently he can act, the more accurately he can fix his boundaries and, very often, the banker can give considerable more latitude to the borrower when he is thus certain in his knowledge.

In this connection, I might tell the story of two large concerns of international reputation, who did business before the war with one of our great financial institutions in New York. Both of these companies were very hard hit at the outbreak of hostilities. It had been the habit of the president of one of these concerns, located in the West, to drop in at their New York bank three or four times a year and go over their situation with them. The company was very prosperous and borrowed in millions. Their bankers were thoroughly familiar with every phase of their situation and were accustomed to being told of all developments, both favorable and unfavorable. The other company, also located in the West, was equally prosperous, but the head of this concern, though he came to New York

(Continued on page 17)

<sup>1</sup>Reprinted from September, 1927, *Window Shade and Drapery Journal*.



## The Crushed Stone Journal

J. R. BOYD, Editor

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## VALUES OF ACCIDENT PREVENTION

(Continued from page 5)

the formation of a general safety committee operating through local plant committees. Fourth, the education of the employee, however tactfully it may be disguised or through whatever means it be accomplished. Fifth, through mechanical and engineering means the diminishing of all hazards and the total elimination of some.

The human spirit is adventurous; it seeks new experiences, new sensations, gropes its way unflinchingly into unknown territory, both mentally and physically. The progress of civilization has largely been due to those adventurous spirits who have dared unknown dangers to blaze the way that later generations may follow in safety. It is not unnatural to believe that in many instances the lack of care and caution of the workman is attributable to this willingness to face danger and a desire to more quickly and effectively serve the ends of his employer, whom he may like, respect and admire. He must be taught to discriminate between the bravery of the hero, courageous without stint, for a worthy cause, and the unnecessary exposure to danger which may be easily avoided with proper care and caution, and that in exposing himself unnecessarily to plant and factory hazards he does not serve his interest nor that of his employer, but actually is jeopardizing both.

I firmly believe that the employee, if convinced that his employer's interest in seeing that he is not hurt is prompted by good will and human kindness will respect and admire his leader all the more for that interest in him and his welfare. He is not in a position to ask that he be protected; he would feel that it was undignified and cowardly to do so, but the responsibility is on the executive none the less. I wish that everyone who has labor under his control and who feels a proper responsibility for their welfare, could carry in his mind and heart those lines of Pope, which, though written two centuries ago, seem prophetic in their application—

Teach me to feel another's woe  
To hide the fault I see  
That mercy I to others show,  
That mercy show to me.

May God speed the day when this thought shall guide and govern our conduct.

## Engineering Bulletin No. 3

**I**N CONTINUATION of the plan of the Bureau of Engineering to publish periodically information and data of interest and value to the producers and users of crushed stone, Engineering Bulletin No. 3, "The Water-Ratio Specification for Concrete and Its Limitations," has recently been prepared and is now ready for distribution.

It is no exaggeration to say that of all the developments in the field of concrete construction during recent years, that of the water-cement-ratio theory has undoubtedly attracted more universal attention than any other one thing. That the water-cement-ratio theory has been of very great value cannot be questioned, but it is undoubtedly equally true that in its application sufficient attention has not been given to some of the factors which, it would seem, are important enough to warrant consideration.

In Bulletin No. 3 the Bureau of Engineering has discussed the water-ratio specification for concrete and pointed out its limitations. The importance of making this information available to the users of crushed stone cannot be over-emphasized and we earnestly suggest that the members immediately place their orders for this Bulletin with the Secretary's Office.

**MAKING A FRIEND OF YOUR BANKER**

(Continued from page 15)

often, rarely went inside the doors of his bank and never at any time discussed with them the intimate affairs of his institution.

Under war conditions, both companies simultaneously lost a great portion of their business and almost overnight were involved in a precarious financial situation. It became a question as to whether or not the bank should call their loans. In the case of the first company, the bank was in full possession of the facts and, because of their frequent contacts with its presiding head, had developed a sincere respect for his ability, and a confidence in his judgment and in his policies. It was eventually decided to continue the loans to this concern.

In the case of the second company, the bank had never been taken into the confidence of the management, knew the president only casually and had no

first-hand knowledge of his policies or of the internal situation of his company. Because of lack of information, it was deemed too precarious to continue the bank loans to this company, which may have been equally deserving of credit with the first company if its situation had been fully apparent. The one concern is now strong and even more prosperous than before the war, but the other one went to the wall within eight months, mainly because its management had refused to take its bank into their confidence.

The average loaning officer in a bank, if he be wide awake and onto his job, knows a little bit about a great many different lines of business. What he knows is general information, gathered from contacts with several houses in the same line. He could not step in and run such a business himself, but he can often give sound advice and has a bird's eye perspective that may be of considerable benefit to the management.

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The National Crushed Stone  
Association

Eleventh Annual Convention

West Baden, Indiana

January 16, 17, 18 and 19, 1928

*A*LL Crushed Stone Producers of the United States and Canada, whether or not members of this Association, are extended a most cordial invitation to attend and share with us the benefits and pleasures of the Convention.

The National Crushed Stone Association

651 Earle Building, Washington, D. C.